DOCUMENT RESUME

ED 436 173 IR 019 798

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TITLE Psychological Factors Influencing World-Wide Web Navigation.
PUB DATE 1999-02-00
NOTE 7p.; In: Proceedings of Selected Research and Development Papers Presented at the National Convention of the Association for Educational Communications and Technology [AECT] (21st, Houston, TX, February 10-14, 1999); see IR 019 753.
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Analysis of Variance; Computer Interfaces; *Design Preferences; Individual Differences; *Navigation (Information Systems); *Orientation; Predictor Variables; *Psychological Characteristics; Recall (Psychology); Spatial Ability; Users (Information); *World Wide Web
IDENTIFIERS Distraction; Links (Indexing); Sensation Seeking; *User Characteristics; User Preferences; *Web Sites

ABSTRACT

This experimental study investigated internal (psychological characteristics) and external (World Wide Web site features) factors influencing learning and disorientation in Web navigation. The research design was a two-factors ANOVA (ANalysis Of VAriance) with mode of navigation (linear, nonlinear) and distracters (i.e., the presence of "seductive" links) as the two factors. Volunteer participants (n=75) were recruited from Internet listings that advertised the study, drawing from a diverse nationwide population. This paper reports findings of the following dependent measures as they relate to the two-factor research design: friendliness of the Web site, attribution of disorientation, overall level of disorientation, confidence in navigating the Web site passage, interest in Web site passage topic, accuracy at stating main point of the passage, and number of ideas recalled from content of passage. It was found that preference for sensation-seeking behavior and/or spatial-holistic ability did not influence the participants' perceptions of disorientation. Other results indicated that recalling examples from the text was facilitated when the site had no distracters, but an interaction indicated that participants' conception of the main point of the passage was negatively influenced if the site had no distracters when in the nonlinear navigation mode. (Author/MES)

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PSYCHOLOGICAL FACTORS INFLUENCING WORLD-WIDE WEB NAVIGATION

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Abstract

This experimental study investigated psychological characteristics and external web-site features influencing learning and disorientation in web navigation. The research design is a 2X2 ANOVA with mode of navigation (linear, nonlinear) and distracters (i.e., the presence of "seductive" links) as the two factors. The paper reports findings of the following dependent measures as they relate to the two-factor research design: friendliness of the web site, attribution of disorientation, overall level of disorientation, confidence in navigating the web site passage, interest in web site passage topic, accuracy at stating main point of the passage, and number of ideas recalled from content of passage. It was found that preference for sensation-seeking behavior and/or spatial-holistic ability did not influence the participants' perceptions of disorientation. Other results indicated that recalling examples from the text was facilitated when the site had no distracters. But an interaction indicated that participants' conception of the main point of the passage was negatively influenced if the site had no distracters when in the nonlinear navigation mode.

Introduction

Given the rapid growth of the Internet and the commensurate need to design improved systems for participant access and learning, this study investigates psychological issues related to navigation in the World Wide Web. In this paper, I am going to focus on results from an experiment that relate to *psychological characteristics* (e.g., sensation-seeking behavior, spatial-holistic ability, disorientation, attribution, confidence, perceived friendliness of web-site and interest in content), *learning* (e.g., accuracy at stating main point of the passage, number of ideas recalled from content of passage), and *external web-site features* (e.g., mode of navigation, the presence of distracters), of World-Wide Web navigation.

These three areas can be conceptualized in terms of a user's perception of disorientation, defined as uncertainty in one's location. A common phenomenon on the World Wide Web is for a participant to become sidetracked by other links and become disoriented when seeking a particular location. From the participant's perspective, did s/he make the right choice or will s/he have to back-track? Did she temporarily ignore her original intent because she has a high need for novelty and stimulation? Additionally, much of the inconvenience of disorientation may be perceptual. Like waiting in line at the grocery store, where some people become livid while others use it as a chance to start up a conversation, disorientation on the web may be considered as exciting or as an annoying distraction that prevents the participant from staying on-task.

Purpose

The purpose of this experimental study is to evaluate the role of internal (psychological characteristics) and external (web-site features) factors in influencing Internet navigation and disorientation. This research also facilitates the development of web-site features that better accommodate navigation preferences and learning. For example, a person low in sensation-seeking tendency may prefer a more streamlined approach to navigation with limited links whereas a person high in sensation-seeking tendency may prefer more varied navigational features with a greater number of available links or distracters. In terms of learning, the participants are tested for content learned from the participant's navigation of the web site passage. This has direct implications for design and development of web-based learning environments. By assessing perceived factors relating to web navigation, the research provides information regarding the web site features that participants believe are important for a web-site's participant-friendliness.

Participants

Volunteer participants were recruited from Internet listings that advertised the study, drawing from a diverse nationwide population. All participants had prior experience navigating the Web as a requirement of participation in the study. They were compensated for participation. The seventy-five participants represented a diverse population, with 79% white and 21% non-white (including primarily Asian and Hispanic). The mean age was 30.47 with a standard deviation of 1.26. Of the 74 participants reporting gender, 34 (46%) were female and 40 (54%) were male.

Experimental Design

The study was originally designed as a two-way ANCOVA design with system knowledge as the covariate because systems knowledge has been shown to directly affect participants' competencies at navigation (Hill & Hannafin, 1996). However, systems knowledge scores were very high (X=4.08 on five point scale) and positively skewed, precluding the value of using them as a covariate.

Consequently, the experimental design is comprised of a two-factor (2x2) ANOVA design with the two factors of navigation mode (linear, nonlinear) and distracters (presence or absence). These two factors relate to the external features of the web-site. There were four web sites that reflect different instantiations of the two factors (e.g., linear + distracters; linear + no distracters; nonlinear + distracters; nonlinear + no distracters). The four web sites all contain nine web pages of identical text that comprise a passage on *Internet use for education*, adapted from Andy Carvin's web site at http://edweb.gsn.org/web.intro.html. The software developed for the experiment randomly selected one of four web sites for each participant to navigate.

In the linear navigation condition, the participant is forced to proceed through the web-site similar to reading a textbook, only able to move forward and backwards. While this is a somewhat artificial treatment, it was designed to maximally contrast with the nonlinear mode of navigation. In the nonlinear navigation mode, the participant has immediate access to all pages at any given time through a navigation bar on the left-hand column.

The distracter condition contained six distracting links placed throughout the nine pages of the web site. The six distracting links were designed to figuratively "seduce" the participant to click on the link (e.g., David Letterman's Top Ten, jokes, Dilbert cartoons) and encourage off-task behavior. Each distracter was comprised of a small picture with a link indicating to "Click here to ..." The no-distracter condition did not contain any distracters.

The task for all participants was to successfully find the headings under which five statements were located within the nine-page online passage. Participants could access the statements from any page on the web site. In determining the appropriate heading location, the participant did not have open-ended access to the Internet; rather, s/he was limited to the pre-defined web pages for each web configuration. The toolbars were de-activated so that s/he could only access web pages included in the experimental web site. Software was developed in Perl to track the participant's path through the web site in terms of total time spent, time spent on distracting links, and the number of distracting links selected. The whole procedure took approximately an hour.

Research Procedures

Following completion of the initial task, the participant was profiled online according to the following two psychological dimensions: preference for sensation-seeking behavior and spatial-holistic ability. In terms of sensation-seeking preference, participants answered a battery of questions pertaining to preference for sensation-seeking tasks (from Zuckerman, 1979). See Appendix A for example items. These 34 questions consisted of paired statements from which the participant would select the one statement best describing him/her. For example: A) I would prefer living in an ideal society where everyone is safe, secure, and happy; or, B) I would have preferred living in the unsettled days of our history. The mean score of the participants was 18.50 (sd=5.83) with a possible range of 0-34. In terms of spatial-holistic ability, participants completed the Street Test (Street, 1931), a thirteen-item gestalt completion test. This instrument assessed spatial-synthetic ability by requiring the participant to mentally construct the whole picture from a partially-represented figure, such as a figure of a bearded man, a cat, or a locomotive. See Appendix B for two example figures. The mean score of the participants was 7.36 (sd=2.52) with a possible range of 0-13.

Additionally, information regarding the participants' prior knowledge was collected in terms of content knowledge of the passage's topic, and systems knowledge. Participants' mean prior content knowledge of the use of the Internet for education was 3.65 (on a 1-5 Likert scale where 5 is extremely knowledgeable) with a standard deviation of 1.05. As mentioned previously, systems knowledge scores were very high (X=4.08 on five point scale) and positively skewed, thus not lending much information to differentiate participants.

The following dependent measures were assessed through an online questionnaire:

Psychological factors

- Friendliness of the system
- Attribution of disorientation
- Overall disorientation
- Confidence in navigating the site
- Interest in passage topic

Learning

- Accuracy at stating main point of the passage
- Number of ideas recalled from content of passage

Predictions

First, in terms of psychological factors, it was predicted that individuals differing in sensation-seeking preference and spatial-holistic ability would prefer different web-site features. For example, a person low in sensation-seeking tendency may prefer a streamlined site with limited links and options whereas a person with high sensation-seeking tendency may prefer more varied navigational features with more links and/or distracters. Furthermore, it was predicted that these two factors would influence other psychologically-related dependent measures, such as perceived disorientation and confidence with navigation on the web-site.

Second, it was predicted that different web configurations (as defined by level of distracters and navigation mode) would differently affect performance on learning and psychological measures (as listed 1-7 above).

Results

Dependent measures were collected for the seven areas listed above, including both psychological factors and learning. Results will be presented in each of these seven areas.

First, in terms of *friendliness of the web-site*, participants were asked to assess the friendliness of the site on a Likert scale of 1-5. There were no statistically significant results in the two-way (navigation mode, distracters) ANOVA with site friendliness as the dependent measure. As would be expected in considering all of the participants (who represent all four web site combinations), participants' confidence in navigating the site was positively correlated to their reported friendliness of the site (r=.411, p <.0001).

Second, in terms of *attribution of disorientation*, participants were asked to "Consider the times when you felt disoriented during the task. Overall, do you attribute your feelings of disorientation to your self or to the web site? (with 1 representing to the self and 5 representing to the web site.)" This question served to assess to what extent participants attributed (i.e., blamed) navigation problems on the web site as opposed to themselves. However, there were no statistically significant results in the two-way (navigation mode, distracters) ANOVA with attribution of disorientation as the dependent measure.

Third, *level of disorientation* was determined from ten Likert-scale questions from Beasley & Waugh's Non-Linear Media Disorientation Assessment instrument (Beasley & Waugh, 1995). As expected, participants' disorientation scores correlated negatively to systems knowledge (r=-.253, p<.05), interest in content (r=-.351, p<.005), and confidence in navigating (r=-.605, p<.0001). From a two-factor ANOVA (navigation mode, distracters), there was a marginally significant main effect for navigation type (F=3.318, p=.07), where those in linear condition were more disoriented (X=13.58) than those in nonlinear condition (X=10.63). This indicates that participants feel more oriented with a nonlinear web-site format as compared to a linear format.

Fourth, there were no statistically significant results in a two-way ANOVA where *confidence in navigating* the experimental web site was the dependent variable. As expected, there was a strong negative correlation of perceived disorientation with confidence in navigating the site (r=-.605, p<.0001). Interestingly, females reported more confidence navigating the site than males (X=4.68 vs. X=4.26, p=.001), yet they also reported more overall disorientation with the site (X=10.52 vs. 13.24; p=.07).

Fifth, there were no statistically significant results in a two-way ANOVA where *interest in passage content* was the dependent variable.

Sixth, participants were asked to *explain the main point of the passage*. Items were scored on a 1-5 scale, with a representative answer receiving a "1" as "It provides a general discussion about the web." and a representative answer receiving a "5" as "It analyzes the possibilities the web offers to educators and its importance as a learning tool." From a two-factor ANOVA (navigation type, distracters), there was a statistically significant interaction of navigation type and distracters (F=4.70, p<.05) for the main point score. This interaction indicates that participants performed better in the linear condition with *no* distracters (X=3.63 vs. 2.62), and in the nonlinear condition *with* distracters (X=3.56 vs. 3.42). Perhaps the distracters in the nonlinear condition forced subjects to expend more effort in discerning the meaning of the passage and were thus beneficial. In contrast, in the linear condition, the presence of distracters negatively affected performance by not fitting in with the linearity of the passage navigation.

Seventh, participants were asked to *list as many benefits* of using the Internet for education as possible, according to the web-site. They were awarded one point for each benefit listed that was stated in the passage. The range of scores was 0-9, with the mean as 3.34 (sd=1.97). A two-factor ANOVA (navigation type, distracters) indicated that there was a significant main effect for distracters (F=6.68, p=.01), where those in web sites with *no* distracters (X=3.90) performed better (listing more relevant benefits) than those *with* distracters (X=2.76). This indicates that the presence of distracters negatively affects idea production (in the form of listing benefits) following the learning experience. Perhaps the distracting links distracted the participant from focusing on and then later recalling passage content.

Discussion and implications

The first prediction, that preference for sensation-seeking behavior and spatial-holistic ability factors would influence perceived disorientation and preferred navigation mode, was not supported based on analysis of the data. However, there was a marginally significant difference in main point scores between those (N=36) with high spatial-holistic scores (X=3.51) and low spatial-holistic scores (X=3.06, p<.1), thereby indicating that spatial-holistic ability facilitated discerning the main point although did not interact with other navigational factors.

In terms of the second prediction, three findings regarding motivation, orientation, and learning will be briefly discussed. First, in terms of motivational factors regarding navigation, there is a clear connection between perceived web site friendliness and perceived orientation within the site. Second, in terms of web site and interface construction, this study indicates that participants feel more oriented with a nonlinear web site format as compared to a linear format. As would be expected, it was found that perceived disorientation was highly negatively correlated to both site friendliness and confidence in navigation. Third, when factoring in learning from the web-site it was found that recalling examples from the text (e.g., benefits of Internet use for education) was facilitated when the site had no distracters. But an interaction indicated that participants' conception of the main point of the passage was negatively influenced if the site had no distracters when in the nonlinear navigation mode. An important caveat is that the participants' task was not to learn the passage; consequently, the two learning measures (stating the main point of the passage, and listing educational benefits of using the Internet) actually assess incidental learning. Overall, this evidence begins to suggest that participants may indeed learn more from a nonlinear than a linear navigation mode. It is not clear whether or not the role of distracters, or "seductive" links, negatively affects learning. Future research should include more comprehensive learning measures.

References

Beasley, R.E., & Waugh, M. L. (1995). Cognitive mapping architectures and hypermedia disorientation: An empirical study. *Journal of Educational Multimedia and Hypermedia, 4* (2/3), 239-255.

Hill, J. & Hannafin, M. (1996). Cognitive strategies and the use of a hypermedia information system: An exploratory study. Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology (18th, Indianapolis, IN, 1996).

Street, R. F. (1931). A gestalt completion test. *Contributions to Education No. 48.* New York: Columbia University, Teachers College.

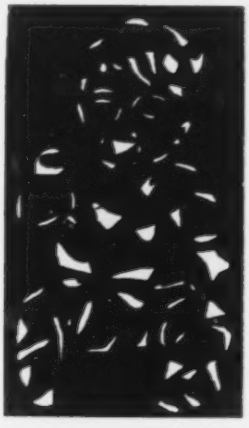
Zuckerman, M. (1979). From *Sensation Seeking: Beyond the Optimal Level of Arousal* (pp. 45-47). Lawrence Erlbaum Associates, Inc.

Appendix A: Sample items from sensation-seeking instrument (from Zuckerman, 1979).

Instructions: Each of the items below contains two choices. Indicate which of the choices most describes your likes or the way you feel. In some cases you may find that both choices describe your likes or the way you feel. **Please choose the <u>one</u> that better describes your likes or feelings.** In some cases, you may not like either choice. In these cases mark the choice you dislike least. This scale should measure only your likes and feelings, not how others feel about these things or how one is supposed to feel. There are no right or wrong answers. Be frank and give your honest appraisal of yourself.

1	I would like a job which would require a lot of traveling.
	I would prefer a job in one location.
2	I am invigorated by a brisk, cold day.
	I can't wait to get indoors on a cold day.
3	I find a certain pleasure in routine kinds of work.
	Although it is sometimes necessary, I usually dislike routine kinds of work.
4	I often wish I could be a mountain climber.
	I can't understand people who risk their necks climbing mountains.

Appendix B: Sample figures from instrument assessing spatial-holistic ability (from Street, 1931).



A baby

A bearded man

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